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ANALYSIS OF RIGHT VENTRICULAR FUNCTION BY FIRST-PASS RADIONUCLIDE ANGIOCARDIOGRAPHY.

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Right ventricular(RV) function was analyzed by first-pass radionuclide angiocardiography, and RV ejection fraction(EF) obtained by this method was compared with that by ECG-gated equilibrium method.
List mode data were collected with ECG for 40 sec. After transit time was decided from a time-activity curve of rough RV ROI, 16 images gated with R wave of ECG were reconstructed from list mode data. Moreover, smoothing and background subtraction was made by instantaneously representing the results on CRT display. In order to avoid the effect of right atruim and pulmonary artery, the final RV ROI was obtained from an edge image operated by Laplacian, an amplitude image and a phase image.
As the result, RVEF obtained by our method appeared to have good correlation with that by ECG-gated equilibrium method (r=0.735) and this method was useful as a non-invasive analysis of RV function.

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RADIONUCLIDE ANGIOCARDIOGRAPHIC ASSESSMENT OF RIGHT VENTRICULAR FUNCTION IN THE PATIENTS WITH OLD MYOCARDIAL INFARCTION.

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To assess the right ventricular function in the patients with old myocardial infarction, 99m-Tc first pass angiocardiography(Baird Atomic, System77) was performed. The subjects consisted of control(C-G, 28 cases), anterior infarction(A-G, 63 cases), inferior infarction(I-G, 47 cases), anterior and inferior infarction(AI-G, 16 cases) and right ventricular infarction(RV-G, 8 cases). Right ventricular ejection fraction(RVEF) in A-G(48±10%) was identical to C-G(48±7%). I-G had lower RVEF(43±9%) than A-G, and RV-G had the lowest RVEF(30±7%) of all groups. Right ventricular end-diastolic volume(RV-EDV) was calculated from RVEF, LVEF, LVEDV and tricuspid regurgitant fraction(TRF). There were no significant differences in RVEDV among C-G, A-G, I-G and AI-G, but RV-EDV in RV-G was larger than other 4 groups. Four patients in RV-G had tricuspid regurgitation(TR) in the chronic phase and TRF calculated from Kirch's circulatory model was from 10% to 40%. Lower RVEF, larger RVEDV and TR in RV-G suggest the increased incidence of right ventricular failure in the patients with right ventricular infarction.

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IMPROVEMENT OF THE FIRST PASS METHOD OVER THE EFFECT OF TIME-VARYING CONCENTRATION OF TRACER AND ITS APPLICATION TO EJECTION FRACTION.

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The first pass method is useful for evaluation of the left ventricular ejection fraction (LVEF) without ECG gating. But, the determinations of LVEF by the first pass method are subject to errors attributable to the effects of rapid inflow or outflow of radionuclide tracer and the time-varying concentration of tracer.
In order to decrease the effect of time-varying concentration, a new method was proposed. The ascending and descending phases of left ventricular time-activity curves were fitted with gamma variate function. A normalized activity at time t may be obtained by dividing the observed activity by the value of the gamma variate function. LVEF was calculated by means of the non-gated first pass method using the corrected time-activity curve. Differences in LVEF determined by the new method and ECG-gated or non-gated first pass method were discussed. Comparison of the new method LVEF measurements with that obtained by the equilibrium gated method was done. Its application was used in experiments using cardiovascular dynamic phantom and in clinical cases.

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IMPROVEMENT OF THE MEASUREMENTS OF CARDIAC OUTPUT USING THE FIRST PASS METHOD.

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Quantative measurements of cardiac output using the first pass method depend on elimination of the area attributed to recirculation of the injected radionuclide tracer. With the increase of the time for passage of tracer through the left ventricle, the recirculation of tracer contributes an increasing part in the descending curve corresponding to this passage.
A new method was proposed to diminish the effect of recirculation. Assuming that recirculation curve takes the form of a gamma variate function, a fit of this function was done at the peak of the recirculation region with the origin set at suitable appearance time and subtraction was performed with respect to the original time-activity curve. We assumed that recirculation began approximately 9 seconds later. Cardiac output was then determined from the new time-activity curve by means of the Stewart-Hamilton method.
The differences of the new method with the conventional Stewart-Hamilton or gamma variate method were discussed. The relationship between the new method and the dye method was also investigated.